

Determining the Potential of AI in Generating Visionary Innovations by Observing Generation Z

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ABSTRACT

Contemporary product development is currently undergoing a profound paradigm shift triggered by rapid advances in the field of artificial intelligence (AI). In an era where dynamism and speed determine market success, the pressing question arises regarding the true potential of this technology for generating innovation and for the field of entrepreneurship. This study examines this transformation process through a pragmatic research approach: the observation of so-called Generation Z. As “digital natives,” these individuals have grown up with digital technologies and should, in theory, exhibit the highest adoption rate for AI tools. As part of a case study at the Munich University of Applied Sciences, Generation Z students were tasked with innovation projects to determine, through a combination of behavioral observation, results analysis, and subsequent surveys, to what extent AI is capable of supporting the process from initial idea to visionary innovation. The focus here was deliberately on revolutionary rather than evolutionary approaches, on generating visionary innovations that go beyond incremental improvements. The results make it clear that AI’s greatest value currently lies in visual inspiration and the communication of complex visions of the future, while original creative work continues to require synergistic interaction between humans and machines.

Keywords: Artificial intelligence, Visionary innovation, Generation Z, Product development, Creativity techniques, Visualization

INTRODUCTION

The integration of artificial intelligence into virtually every aspect of personal and professional life is occurring at a pace that far exceeds traditional innovation cycles. This process is bringing about fundamental changes that are forcing all disciplines to critically reevaluate their existing approaches. There is a feverish effort to determine the specific potential AI offers, how it can be used efficiently, and what business opportunities arise from it. This applies in particular to product development. Here, the key question is whether AI is merely a tool for increasing efficiency or whether it is already capable of autonomously generating innovations and marketable products.

Inseparably linked to this is the philosophical and technical debate regarding the creativity of AI. Can an algorithm develop solutions that go beyond the recombination of existing data? In this study, the focus is

explicitly on visionary ideas—those revolutionary approaches that represent a massive leap forward into the future.

While evolutionary innovations gradually optimize existing products, revolutionary approaches aim for radical breaks with the status quo. Such radical innovations pose a challenge even for human experts, as they require stepping off the beaten path. It is not about the gradual improvement of existing products (evolutionary innovation), but rather about solutions that represent a true “game-changer.” This also raises the provocative question of whether humans can be replaced in this creative process in the medium term, or how a hybrid process must be designed to optimally harness the potential of AI.

Science faces a problem here: development is so broad and dynamic that traditional research formats often can no longer keep pace. While universities were long considered the exclusive pioneers of new technologies, AI development is now largely driven by agile companies and startups. These are often led by young developers who belong to Generation Z. This cohort has a completely different approach to technology; they have grown up with digitalization and often use AI intuitively and without the reservations of older generations (Prensky, 2001). To explore the limits of AI, it therefore made sense to observe precisely this group in their practical work.

A pragmatic approach was chosen for this study: An experiment was conducted at the Munich University of Applied Sciences as part of a course on sustainable innovation in the Bachelor’s program in Mechanical Engineering. Twenty-three students were observed as they used AI tools to solve complex innovation challenges. The goal was to quickly and pragmatically assess the current state of the art and the capabilities of this new generation of engineers. How do the engineers of tomorrow approach AI? What potential can they unlock from the technology without guidance? The study also aimed to examine how realistic the application of AI is in the early stages of product development even now, without users having received specific training beforehand.

STATE OF THE ART AND INDUSTRIAL CONTEXT

The current state of AI implementation in industry is marked by stark contrasts. On the one hand, there are technological pioneers, such as the renowned hearing aid manufacturer GN Group from Denmark, which has not only integrated AI as a key technical feature into its end products but also actively incorporates it into the entire product development process (PDP). Their experience shows that AI is already working very well, though internal procedures and process structures had to be radically adapted to the logic of the algorithms. However, there is still a perceived need for improvement, and further potential is being sought.

On the other hand, there is the vast majority of companies, particularly small and medium-sized enterprises (SMEs). Here, there is often still uncertainty about the concrete benefits. While AI is perceived as a buzzword, it is rarely actively used at the core of product development. One reason for this is often uncertainty regarding the creative quality of the results. (OECD, 2021).

Definition of AI Creativity

The question of whether AI can be creative is increasingly being viewed in a nuanced way within the scientific community. According to Margaret Boden (2004), one of the most frequently cited cognitive scientists in this field, divides creativity into three categories that are essential to our understanding of Generation Z:

1. **Combinatorial creativity:** The recombining of familiar ideas. Here, AI excels at recognizing patterns and recombining them—such as writing song lyrics in the style of Goethe or designing a futuristic car in the Baroque style.
2. **Exploratory creativity:** Pushing the boundaries of an existing style or set of rules within a given space.
3. **Transformative creativity:** Completely breaking existing rules to create something entirely new. Here, AI models often reach their limits, as they are based on historical data. (Boden, 2004).

Current Research

Recent studies conducted between 2024 and early 2026 have intensified the comparison between humans and machines. A groundbreaking study by Bellemare-Pépin et al. (2026), published in *Scientific Reports*, analysed over 100,000 people in comparison to models such as GPT-4 and Gemini. The results show that AI models now outperform the average human in tasks requiring fluid and flexible thinking (divergent thinking). AI generates more ideas in less time (Doshi & Hauser, 2024). However, the same study found that the “creative peak”—the top 10% of human participants—continues to achieve better results than any AI. While AI dominates the “middle ground,” absolute originality (Peak Creativity) remains a human domain. (Bellemare-Pépin et al., 2026, Elgammal et al., 2017).

Another important concept is the Lovelace 2.0 Test (Riedl, 2024), a further development of the Turing Test. An AI passes this test only if it produces a valuable result that the human programmer cannot explain solely based on the input data. Current revisions show that while AIs create deceptively real works of art, they often fail the test in the strict sense, as the results remain statistically derivable from the training data. AI is based on probabilities and has no inner “urge” to create anything; it merely reacts to human input. (Riedl, 2024).

These findings are already a few years old. Given the extremely rapid pace of development in AI, that feels like an eternity. The question, then, is: What is the current state of affairs? Has anything changed? And how is Generation Z dealing with it?

METHODOLOGY AND EXPERIMENTAL SETUP

The experimental setup was designed to create a realistic environment for Generation Z. Participants were selected based on demographic criteria to represent the 20- to 30-year-old cohort. A distinctive feature of the group was that all 23 participants were male and possessed technical expertise

in mechanical engineering. While this represents a limitation in terms of diversity, it reflects the current reality in many technical fields within industry. Significantly more men currently work as engineers in industry; it can therefore be assumed that the results are valid for the field of engineering. However, the generalizability to other gender groups would need to be explicitly examined in follow-up studies.

To simulate an authentic work situation, innovation challenges were chosen as the methodological tool. These are concrete tasks or small-scale challenges that are often designed specifically for students and tailored to a limited scope of effort. Real-world industry projects often fail in an academic context due to the limited availability of industry partners or legal hurdles. Challenges, on the other hand, offer a compact, competitive framework that spurs students on to peak performance and therefore represent the best possible alternative.

This ensured that the participants were addressing a real-world problem and developing their solutions for real-world users. This increased their motivation to engage deeply with the task. A competitive dynamic was also created among the teams, just as it is in real life. The project lasted only four weeks and had to be completed alongside the students' other coursework, meaning there was little time available. These conditions made the students' work more difficult but reflect the reality of the industry. Furthermore, under these conditions, the benefits of tools such as AI become more apparent. Time constraints and the need to manage multiple projects simultaneously present challenges where support from AI would be very helpful.

First, an innovation challenge from a previous year was selected as an exercise so that the students could become familiar with this type of assignment. For the STIHL CUTTING EDGE AWARD, the task was to design future devices for gardening and forestry for the renowned company STIHL. Visionary innovation was explicitly required—that is, ideas for future products. The students were deliberately “thrown in at the deep end.” There was no initial training on how to use AI. This approach was intended to determine how intuitively Generation Z integrates these tools into a traditional development process.

The participants formed five teams of four to five people each. Free team selection was allowed, as experience shows that self-selected teams typically communicate more effectively and exhibit greater tolerance for errors in the early stages of ideation.

During the 4-week project period, several intensive coaching sessions and presentations took place, during which the students could be observed and the results compared and discussed. The focus of the observation was on the working methods, the iteration cycles, and the use of external digital resources. The interim and final results were presented in a plenary session and critically discussed.

EMPIRICAL OBSERVATIONS AND PROCESS ANALYSIS

The observations made during the first part of the project yielded results that partly contradicted common expectations and provided deeper insights into the psychology of human-AI interaction.

The Hurdle of the First Generation of Ideas

Surprisingly, the students did not initially use AI on their own initiative. Despite belonging to Generation Z, there appeared to be a certain reluctance to use AI as a primary creative tool. This could be attributed to the perception of the course as a traditional exam-based assignment, in which students believed they had to produce “their own” work without outside help. But this does not prevent them from doing so in other tasks. This observation may indicate that they would not have automatically used AI for creative tasks. Only after being explicitly asked did they integrate AI, yet even then, its use was not immediately intuitive.

The initial results achieved without AI support were sobering. The level of innovation was low; most proposals were based on familiar patterns and technical optimizations of existing products. Even the initial use of AI did not bring about an immediate improvement. When students asked the AI directly for “new innovations,” it often delivered only superficial concepts that already existed on the market or were technologically trivial. The degree of novelty remained disappointingly low. This is consistent with the study by Camarda et al. (2025), which found that AIs are often prone to a “fixation bias” and tend to get stuck on standard solutions.

The Breakthrough Through Scenario Visualization

A significant leap in quality only occurred once the methodological instructions were changed. Instead of asking the AI directly for product solutions, the participants were asked to utilize the ability of certain AI programs to generate visual representations. This is one of the standout capabilities of some AI programs. They can generate text, images, and videos of incredibly high quality. The students were instructed to have the AI create images of possible future worlds in order to derive innovative product ideas from them. The AI was thus used not as a designer, but as a world-builder. Initially, however, expectations were disappointed here as well, because no ready-made innovations could be extracted from the AI images. For all teams, the AI mostly produced only clichés and already familiar solutions such as flying drones, urban farming, or autonomous vehicles in glass cities.

With AI, it is possible—and often necessary—to go through multiple iterations, i.e., to guide the AI closer to the desired solution using further, more precise instructions based on the results generated so far. This is also a valuable quality of AI that aligns with modern Design Thinking approaches. AI enables simple iterations and supports users in going through the process multiple times to further improve the result. The students involved in the project took the same approach when they had the AI develop solutions for the task at hand. However, this once again led to disappointment, as the level of innovation did not improve as a result. Instead, the same ideas were presented once more, merely visualized differently. This demonstrated once again that the AI was unable to generate any real innovations.

Yet the AI-generated images of future worlds served as a catalyst. For the students, the AI-generated worlds provided a visual point of friction. By confronting these scenarios, they began to derive their own visionary ideas.

The AI provided the context, and humans generated the actual innovation from it. This is a modern adaptation of the stimulus image method, in which the AI takes on the role of a random generator and illustrator. This enabled the students to generate visionary innovations.

This demonstrates that the approach to product development with AI is changing—or must change—because AI lacks precision, and the result usually needs to be further optimized over multiple iterations.

AI as a Game Changer in Communication

In a second step, the ideas developed by the students were visualized using AI. This revealed the enormous power of the technology. The ability to create photorealistic images from vague textual descriptions completely transformed the dynamics of the presentations. This is another area where AI provides invaluable support to product developers. In many cases, this is a game-changer, as it effectively creates an initial prototype that documents an idea. This allows the concept to be presented to others and discussed with them. Images, in particular, are capable of evoking immediate emotional reactions. This makes it possible to discuss visionary concepts with potential customers and gather their feedback at a very early stage of the development process.

However, these possibilities led to a rapid shift in benchmarks. Teams that presented their ideas solely as hand-drawn sketches—which was still the gold standard in academia just a few years ago—fell significantly short in terms of quality. Visual representation via AI quickly became the minimum requirement. This demonstrates that AI is massively raising expectations regarding the quality of the early phase of product development (Fuzzy Front End).

The Second Round: Real-world Relevance and Agorize Challenges

To validate the findings from the first attempt, a second project with even greater real-world relevance was carried out. For this project, students could choose between two current innovation challenges from the “Agorize” platform. Agorize is a global company specializing in outsourcing innovation projects to young talent.

In the first challenge, students had to develop innovative solutions for the construction group SPIE Batignole to improve resilience against the rapidly increasing damage caused by natural disasters such as floods, wildfires, or storms. The second challenge was AVEVA’s EcoTech Emerge 2025, where the task was to develop sustainable innovations for a better future.

In this second round, the findings from the first round were confirmed. The pattern already observed repeated itself: The initial ideation phases without the use of AI were characterized by a lack of visionary depth. Many ideas were trivial or yielded only marginal improvements. This demonstrated once again how difficult it is for most people to generate truly innovative—that is, visionary—ideas.

It was only when the teams once again turned to AI to create future worlds that the desired radically new and surprising approaches emerged. The

results generated by AI—or rather, the visions of the future it produced—were at times reminiscent of scenes from science fiction films, yet remained technically sound and feasible in almost all cases.

Once again, it became clear that the AI did not deliver visionary ideas “at the push of a button.” Rather, by visualizing complex environments, it enabled the students to overcome their own cognitive blocks. The AI served as a mirror for their own thoughts and helped them refine and visualize these ideas. This iterative process between human and machine proved to be the most effective method for generating visionary output.

ANALYSIS OF SURVEY RESULTS

Following the practical phases, a detailed survey was conducted to quantify the subjective experiences of the 23 students. Fifteen students participated in the survey. It is an interesting side note that, despite time explicitly set aside in the lecture, not all participants responded,

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Usage Patterns and Tool Preferences

The survey revealed a nuanced picture of AI usage. While the observations showed a strong tendency toward visualization, half of the survey participants stated that they had primarily used the AI for information research, while the other half emphasized the visualization functions. This suggests a discrepancy between perceived usage and the actual impact on the process.

Market leaders dominated the selection of AI systems. ChatGPT was mentioned by 12 people, Google Gemini by 10. Interestingly, Microsoft Copilot was mentioned only twice, despite its deep integration into common operating systems. Specialized tools such as Perplexity or Canva were rarely mentioned. The main reasons for choosing the tools were their easy, free availability and brand recognition. A smaller proportion of students (9 out of 15) indicated that they also selected the tools based on qualitative criteria, suggesting existing expertise.

Assessment of the Benefits for Vision

When asked how helpful AI was in generating new visionary ideas, over 60% (8 out of 13 responses) said the technology was helpful to very helpful. However, about 30% rated AI as less helpful. This ambivalence reflects the observed disappointment when expectations of an “autonomous idea machine” were not met.

Regarding experience, 79% stated that they had had a lot to a great deal of experience with AI even before the course. Only 21% had little experience. This high figure confirms Generation Z’s technological affinity, but also shows that even within this group, a homogeneous level of knowledge cannot be assumed. Compared to the average of the general population, where active

use of generative AI often remains in the low double digits, this group is, however, far ahead.

DISCUSSION OF FINDINGS AN METHODOICAL REFLECTION

The results of this study enable an in-depth discussion of the role of AI in creative product development.

AI as a Visualization Tool

The greatest strength of current AI systems undoubtedly lies in visualization. In the early stages of product development, the communication of visions is often limited by engineers' lack of drawing skills. AI democratizes the ability to represent complex ideas visually. This is a "game-changer," as visionary ideas are often so far removed from the usual standard that they are difficult to convey without strong visual support.

Limits of Autonomous Innovation

The study has made it clear that AI (as of today) does not create visionary innovations "out of thin air." The results of AI without human control were often generic. The actual creative achievement lay in interpreting the AI-generated stimulus images and translating them into technically feasible concepts. In this context, AI functions more as a high-performance brainstorming tool than as an independent inventor.

Characteristics of Generation Z

Observations of Generation Z show that while this group has a strong affinity for technology, it still requires methodological guidance to fully harness the potential of AI. One interesting aspect is their lack of familiarity with these tools. While older generations often express concerns regarding data protection and confidentiality, young engineers take a more pragmatic approach. This presents opportunities for faster adoption, but also poses risks to the protection of intellectual property within companies.

Limitations of the Study

Critical limitations must be taken into account:

- The small sample size of 15 to 23 participants does not allow for statistical generalization to the entire population.
- The absence of a control group (e.g., experienced engineers over 50) limits the comparison of generational effects.
- The assessment of creativity and "vision" remains subjective to a certain extent.
- Only a single round of testing was conducted; long-term effects could not be examined.

CONCLUSION

This paper highlights the immense potential, but also the clear limitations, of artificial intelligence in the development of visionary innovations. AI-supported visualization emerges as the greatest added value. It enables ideas to be communicated with a level of quality and speed that was unthinkable just a few years ago. This makes it possible to discuss radical innovations at a very early stage of the development process and with impressive quality. Among other things, this enables the communication and exchange of information about the product or the idea. This is particularly advantageous for visionary ideas, as the solutions there are very far removed from familiar products. Through the images it generates, AI can help develop visionary innovations.

AI helps expand the “horizon of the conceivable” by serving as a generator for future scenarios. These function similarly to the classic creativity method of teaser or stimulus images, but with much greater relevance and adaptability. True visionary depth, however, still requires the human engineer to assemble the fragments generated by AI into a coherent, technically feasible whole.

For industry, this means that product development processes must be adapted. It is not enough to simply provide AI tools; employees must learn to view them as methodological tools for inspiration. The paper makes it clear that Generation Z is best suited for this, provided they receive methodological support in interacting with AI. The combination of young talent’s uninhibited approach and the visualizing power of AI will set the standard for generating innovation in the future.

However, limitations were also identified. For example, the AI tools used were unable to deliver truly visionary ideas within the short duration of the project. The transferability of the results to industry must also be closely examined in further studies.

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